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Value-Added Tax Revenue as Incentive for Renewable Energy Development: Palestine as Case Study

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ABSTRACT

Net billing of renewable energy electricity is a new regulation in Palestinian territories. Net billing system includes several implementation scenarios, sale of the entire production, self-consumption with the possibility of exporting energy to the grid, and self-consumption with the permission to store and export electricity. The household sector is considered final consumer in the VAT system, this system allows for double taxation, whether on equipment or purchased electricity. This research aims to conduct an analytical comparison between the VAT revenues of the net billing scenarios for government in residential sector. The possibility of utilizing the surplus VAT to incentivize renewable energy in household sector is examined. A 5 years' period is considered in the analysis, since regulations are changing from time to time, to determine the difference in VAT revenues and potential of incentives. The carried-out analysis shows that there is a tangible difference in VAT revenues in favor of the government between the various cases of net billing. It is recommended to utilize the difference in VAT revenues, to incentivize Photovoltaic investments in the household sector. In the most optimistic scenario, considering 10% subsidy, around 60 MW was expected to benefit from the incentives. Based on the obtained results, an incentive policy for the household sector was recommended, taking advantage of differences in value added tax. The proposed incentives in this study provide a basis for decision-makers to develop a sustainable national renewable energy policy to stimulate investment in renewable energy in the residential sector.

Keywords: Alternative Energy Sources, Government Policy, Sustainability, Net Billing, Value Added Tax
JEL Classifications: Q42, Q48, Q56

1. INTRODUCTION

Electrical Energy is one of the most significant challenges facing the Palestinian government. The national renewable energy plan 2025-2030 clearly indicates the shortage of electrical energy in the Palestinian territories, and most of the consumed electricity is imported. Therefore, renewable energy is considered one of the proposed solutions to enhance energy security. Local electricity grids also have limited capacity for renewable energy due to their age, fragmentation, and lack of integration. These challenges present an opportunity for renewable energy, especially in the domestic sector, to be a practical solution to provide electricity through renewable energy systems (Palestinian national renewable energy plan, 2025-2030).

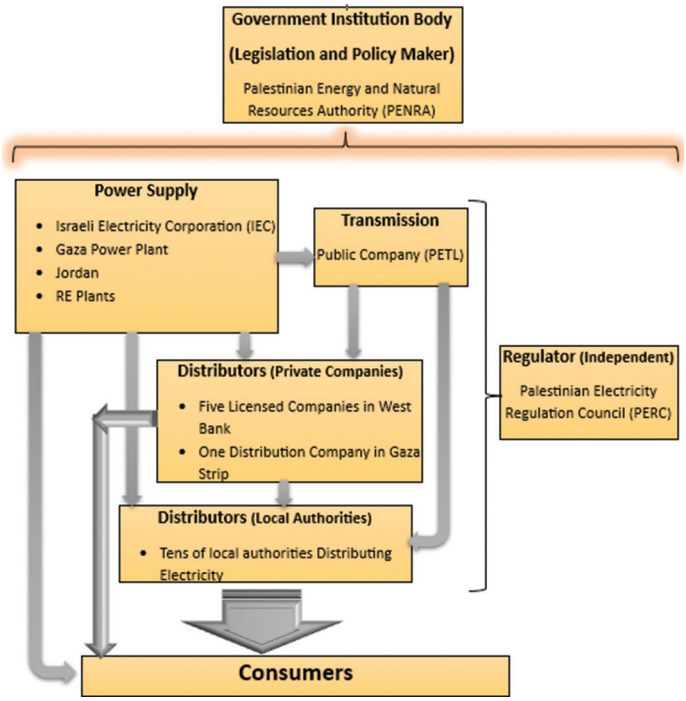
The electrical energy sector is considered as one of the important foundations of other economic sectors. It provides vital services to the productive and service sectors, as well as to the domestic sector in the Palestinian territories. After Oslo agreement, between the Israeli government and Palestine Liberation Organization, PLO, the Palestinian government established the Energy Authority, PENRA, in 1995 to regulate the electric power sector, which had previously relied on local authorities. Essential progress was made in regulating this sector through the establishment of a government-owned transmission company, PETL, the Palestinian Electricity Regulatory Council, PERC, and the licensing of five companies to distribute electricity in West Bank, in addition to one distribution company in the Gaza Strip (Khaldi and Musa, 2022).

Licensed companies distribute approximately 70% of the consumed electricity in the Palestinian territories, while the remain electricity is distributed by local authorities. However, significant challenges remain facing this sector, resulting from the fragmentation of distribution grids due to land classifications, especially in the West Bank. Around 60% of the land is classified as Area C, meaning that it is outside the administrative control of the Palestinian government, preventing the establishment of a transmission system to serve the local grids (Khaldi and Musa, 2022).

Figure 1 illustrates the actual electrical energy sector in Palestine; some complexities arise in the flow of electricity from suppliers to consumers. The national electricity transmission company handles only a portion of imported electricity, while the majority comes directly from abroad through distribution companies or even local authorities. In rare cases, imported electricity reaches the end consumer directly, bypassing the transmission company or distributors. This, in turn, presents a challenge for policymakers in centralized electricity policies, including those related to renewable energy.

The Palestinian government has identified renewable energy as a clean, and local source of energy. The first renewable energy strategy was approved in 2012, which aimed to reach 130 megawatts (MW). The Palestinian National Renewable Energy Plan 2025-2030 indicates that the previous strategy achieved 118 MW out of 130 MW, mostly from solar energy, with the exception of a small portion, <1 MW from biomass. The Palestinian territories rely heavily on imported electricity, mainly from Israeli Electricity Corporation, IEC, account for 86% of supplied electricity, while imports from Jordan constitute 2.4%, and electricity generated by the sole power plant in Gaza constitutes 6.3%. Renewable energy constitutes the remaining 5.3% in 2023, according to the National Renewable Energy Plan 2025-2030, which was approved in the first half of 2025 by the Palestinian cabinet. The target share of renewable energy in 2030 in the total electricity consumption is 30% (National Renewable Energy Plan, 2025-2030).

Figure 1: Palestinian electricity structure



The domestic sector is the primary consumer of electricity in the West Bank and Gaza Strip. According to Palestinian Central Bureau of Statistics, PCBS, around 67% of electricity was consumed in the domestic sector (Palestinian Central Bureau of Statistics, 2022). This highlights the importance of the domestic sector in the Palestinian electricity system. The World Bank-funded energy efficiency Roadmap in 2016 indicates a shift in lifestyles in the Palestinian territories towards urbanization, which is increasing demand for electricity (West Bank and Gaza Energy Efficiency Action Plan, 2020-2030; 2016). The annual growth rate in electricity consumption is estimated at 3-5%, according to the National Renewable Energy Plan 2025-2030.

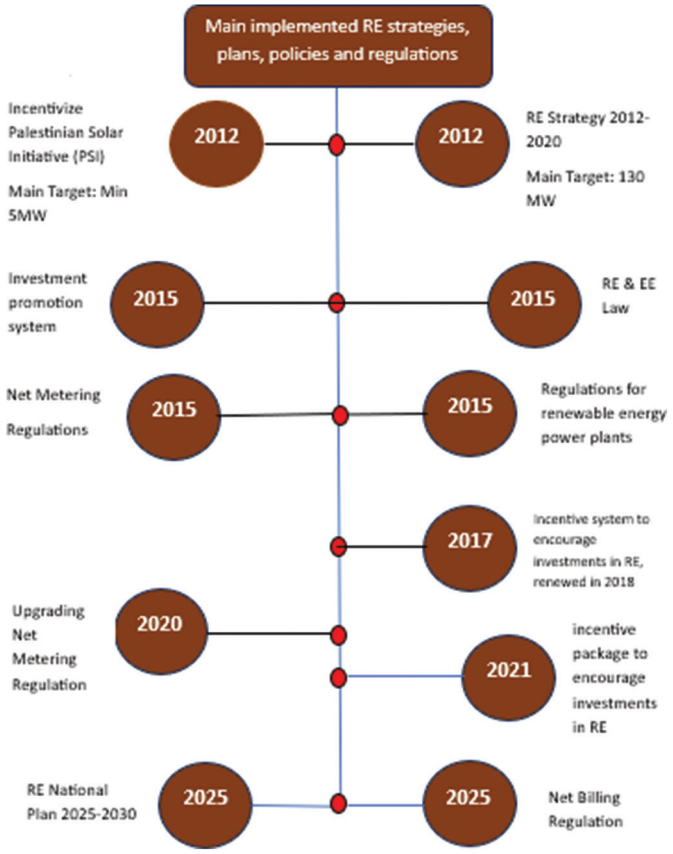
The renewable and energy efficiency law was issued in 2015 to regulate renewable energy and energy efficiency in the Palestinian territories and define the roles and responsibilities of local institutions. The first regulation, allowing the residential sector to invest in renewable energy using net metering, was issued in 2015 by the Palestinian Council of Ministers and remained in effect until October 14th, 2025, when it was replaced by net billing system.

According to PERC, there are two systems in place in the Palestinian territories to regulate investment in renewable energy. The first one covers power plants built for sale and excludes self-consumption. The second system is net metering, which regulates the renewable energy in electricity-consuming sectors, including the residential sector (PERC website page). The net billing system was approved on October 14, 2025 by the Palestinian cabinet as an alternative to the net metering system.

The net billing system includes three scenarios: The first one involves total production for sale separated from consumption from grid, through a dedicated production meter for export to the grid and a dedicated meter for consumption from the grid. The second scenario allows both self-consumption and export, while the third system includes self-consumption, export, and storage. The first and second scenarios do not allow storage, except for emergencies, while the third system allows storage (Palestinian Energy and Natural Resources Authority, 2025). Figure 2 illustrates the main implemented strategies, plans, policies and regulations in the field of renewable energy in Palestinian Territories.

This study aims to examine the impact of the net billing system, approved recently, on the Palestinian government's value-added tax revenues in the household sector. The study will consider the three scenarios of net billing system and identify their impact. The potential of utilizing such surplus VAT for incentive mechanism to enhance renewable energy in the Palestinian residential sector will be examined. Previous studies in this field will be evaluated, in addition to interview of local experts in the field. An analytical Microsoft excel sheet will be developed to quantify the impact on VAT revenues and to present recommendations that could be useful for policy makers in the Palestinian territories.

Figure 2: Main Palestinian strategies, plans, policies and regulations related to renewable energy



2. LITERATURE REVIEW

China implemented preferential VAT policies to stimulate and develop renewable energy industries, but the actual impact of these policies remains unclear. Positive effects of VAT incentives on the profit of solar energy companies, contribute to the development of fiscal policies to support the transition to renewable energy, and indicates that properly designed policies and incentives can play a role in promoting energy sustainability. The policies in China using VAT as an incentive tool resulted in improved profitability for renewable energy companies, considering disparity in response between renewable energy types (Ying and Mayburov, 2025).

European Union is restructuring indirect taxes to become more efficient and effective, in addition it is linked to environmental goals, particularly with regard to the circular economy. The value-added tax (VAT) has advantages that encourage decision-makers to employ it in a way that serves environmental goals. Concept of a green VAT, without any legislative changes, but rather as a hypothetical concept was recommended by some researchers (Traversa and Timmermans, 2021).

Alternative to the United State government's plan to reduce the tax credit from 30% to 10% in 2017 was proposed. It offers a gradual alternative to avoid the potential collapse of the solar energy industry due to the high fixed costs of solar energy. The presented scenario in which the credit reduction was gradually phased out through 2024, Solar photovoltaic (PV) will remain competitive, provided that the industry continues to reduce its costs (Comello and Reichelstein, 2016).

Nigerian experience with tax exemptions, including the value-added tax for renewable energy in Nigeria, was investigated. Despite the existence of these incentives in Nigeria, their effectiveness is limited for several reasons, including the short duration of the incentives, limited support for off-grid systems, weak integration, and weak coordination between institutions. Reforming the incentive structure and establishing a coordination agency was recommended (Ihugba et al., 2025).

Relationship between taxes, technological innovation, open trade, and renewable energy investments was discussed. Several renewable energy-producing countries examined, and showed a negative impact of taxes on renewable energy investments. Conversely, a positive impact of open trade on investments in this field was recognized. Renewable energy-producing countries improve their tax frameworks to enhance innovation and open markets were recommended, thus encouraging investment in renewable energy (Ebaidalla, 2024).

Tangible positive effects on net lending values were identified, during the transition to sustainable energy in the Palestinian territories. Investment in renewable energy enhance the local economy, in addition, the economic benefits are 5 times greater than relying on imported electricity. A decrease in net lending values when investing in local renewable energy was observed. Other positive economic outcomes for the Palestinian government in the form of net income due to the possibility of leasing government land for renewable energy projects was noticed (Khaldi and Musa, 2022).

Electricity tariffs continued to rise throughout 2025 in Palestinian Territories. Prepaid meters tariff increased by 8% in March, increasing the fixed tariff for residential prepaid meters from 0.15 USD to around 0.16 USD/kw-h, excluding VAT. This increase is the highest since the establishment of the Palestinian Authority (Palestine Economic Policy Research Institute, 2025).

Available data by PENRA shows that the number of solar energy systems installed on rooftops in the Palestinian residential sector in mid-December 2025, reached around 7,200 PV systems (Solar Projects, PENRA, 2025). The National Renewable Energy Plan 2025-2030 also included an initiative for the residential sector aimed to install renewable energy systems on 9,000 home rooftops during the plan period, which in turn opens up broad prospects for renewable energy systems in the residential sector (Palestinian renewable energy national plan, PENRA, 2025).

Local programs such as SUNREF program, run by local banks such as Bank of Palestine and Cairo Amman Bank, provide soft loans and partial fund for renewable energy projects. This program is supported by some donors, i.e. AFD and EU. Revolving fund program for financing renewable energy projects from PENRA and funded by the World Bank is also implemented. The program is based on smooth payment terms without bank interest, but it does

not include an additional incentive in the meantime, according to available data from the Palestinian Energy and Natural Resources Authority. Meanwhile, the Palestinian Authority provides income tax incentives to productive sectors in the case of investment in renewable energy for self-consumption purposes and for renewable energy plants, according to what is published on PERC website page. These incentives do not include the household sector (PERC web site page).

Population growth is a major driver of increased energy demand, which in turn leads to a depletion of fossil fuel resources and environmental damage. In addition, investment in renewable energy is inconsistent, which require proper strategies for sustainability. Therefore, the need for clean and renewable energy sources, such as solar, wind, and hydroelectric power, is essential. The obstacles hindering renewable energy investment and the incentives that could accelerate it was examined. The necessary strategies for transitioning from fossil fuels to clean, renewable energy, was studied also (Qadir et al., 2021).

The response of renewable energy deployment to incentive policies in Turkey and the European Union was analyzed. Multiple analytical methods were used to examine various incentives, and the study covered a longer timeframe than published researches. The results showed a positive impact on renewable energy from grants, research, taxes, certifications, and policy support. However, the study revealed contrasting results for direct investments and loans. The importance of research and development activities, tax incentives, and effective policies for the green economy in the countries studied was emphasized (Bölük and Kaplan, 2022).

Renewable energy policies in Palestine were assessed by Juaidi et al. 2022 to develop structural frameworks for improving sustainability in the Palestinian renewable energy sector. Comprehensive and integrated approach to all types of energy consumption, including electricity, and transportation was recommended. Simulation software was utilized to analyze energy security over the next 20 years, to meet consumer demand renewable energy growth of 5-10% was obtained. The lack of incentives for solar energy was identified, and recommended incentives for other renewable energy sources. Streamline licensing procedures for renewable energy to make it more attractive to investors was suggested. Furthermore, the study addressed the importance of establishing clear specifications and standards for renewable energy systems, and related grid connection. Finally, the creation of a specialized body to oversee national policies and their effective implementation, and the development of a policy framework for energy sustainability in Palestine was suggested (Juaidi et al., 2022).

Value-added tax (VAT) has a unique application in Palestinian Territories, differing from other countries. Imported goods pass through Israel, based on agreement between the Palestinian Authority and the Israeli Government, the Israeli government collects the taxes and VAT and pays this money to the Palestinian Authority. In addition, Palestinian government collect VAT out of local service and other activities, considering 16%. However, the Israeli government has deducted debts owed by distribution companies and local authorities for electricity bills, water bills, and others. This is known as net lending, which amounted to 800 NIS million, according to Ministry of Finance data for 2021, such overlap has created some complications in this field (Khaldi and Musa, 2022).

Furthermore, the household sector is considered the final consumer and is not entitled to claim VAT on purchased materials or equipment related to solar systems. However, the exported electrical energy to the electricity grid will be subject to VAT upon sale to the final consumer. The percentage of exported produced electricity by PV systems to the grid, according to new net billing regulation, varies from 100% in the case of a full sale of production to low percentages in the case of storage capacity availability.

The above-mentioned studies examined the impact of value-added tax (VAT), customs duties, and incentive policies on renewable energy. The studies highlighted the impact of renewable energy investments on the local economy compared to electricity imports in the Palestinian context. However, previous studies lacked specific research in the Palestinian territories, focusing on the impact of renewable energy on government VAT revenues, or the potential for utilizing VAT surpluses as incentives for new renewable energy investments, particularly in the residential sector. The recently implemented net billing system in the Palestinian territories is a novel application, opening up significant new avenues for research.

Therefore, this study will draw upon the research and studies discussed in this literature review, considering their underlying concepts, research methodologies, and findings. This research will focus on the impact of implementing the net billing system on government VAT revenues and the possibility of using a portion of the surplus revenues as incentives for new investments in solar energy systems. This will serve as a foundation for policymakers to develop incentive policies in the renewable energy sector.

3. RESEARCH METHODOLOGY

The quantitative research methodology to obtain data has been adapted in this study. Data is collected from public institutions such as the Palestinian Energy and Natural Resources Authority and the Palestinian Central Bureau of Statistics. It also engaged with experts in this field to collect data and examine the assumptions that has been developed in this study. Assumptions included the average cost of solar energy systems in the household sector and the expected capacity of systems that could be installed in the household sector. It also examined the expected export to grid percentages from solar energy systems in case of self-consumption, whether with or without storage, the practical production energy per installed kilowatt, and the percentage of production decline due to efficiency over the time. Figure 3 illustrates the flow of data collection and data processing to obtain the results:

The National Renewable Energy Plan 2025-2030 includes initiative targeting 9,000 homes for RE. The total target, including the initiative, has not been specified in the plan. The Deputy Chairman of the Palestinian Energy and Natural Resources

Figure 3: The adapted methodology flow process

Authority for Technical Affairs was interviewed to inquire about the total expected homes, including the initiative, and the expected percentages between net billing cases. The expected total target for residential sector depends on the progress in implementing the approved initiative in the national plan. In case the initiative implemented successfully, it is expected that the total number could reach 15,000 homes by 2030, of which 12,000 with storage systems, and the remainder could be split equally between the buy-all and sell-all case, and self-consumption without storage capacity. Therefore, RE capacity in the domestic sector is estimated until 2030 for 75 megawatts, utilizing the net billing regulation. However, achieving the target depends on many factors, i.e. incentives, implementation facilities, and the economic situation in the coming period. Therefore, more than one possibility should be examined in the analysis in terms of quantities and percentages.

A comparison was made between the value-added tax (VAT) for the various scenarios and the case of absence of solar energy systems. The existing scenario of importing electricity from abroad, particularly from IEC, and the alternative of installing renewable energy systems on the rooftop of homes in the domestic sector. The difference was analyzed, reflecting the impact of renewable energy on VAT, as the target of this study. A special analytical excel sheet has been developed for the purposes of this study to arrive at numerical results that illustrate the impact of renewable energy on VAT for each installed megawatt. In addition to utilizing the surplus of VAT to incentivize the transition toward renewable energy in residential sector, was analyzed.

4. RESULTS AND ANALYSIS

Available published data by PENRA, the Palestinian Central Bureau of Statistics, and PERC were collected and cited throughout this research. Local experts were consulted to obtain a variety of data for the purposes of this research's analysis. The production of RE system per kilowatt in the 1st year is estimated at 1,700 kw-h, while the annual decline in production is estimated at 0.7%. The cost of a renewable energy system per kilowatt is estimated at 1,000 USD without storage systems and 1,500 USD with storage capacity. The typical case, 5 kw-h for 5-kw systems, was used as the basis for the subsequent analysis, and expected to be the majority of investments in solar energy systems in residential sector.

The average purchasing price per kilowatt-hour in the residential sector from distributor is around 0.16 USD, excluding value-added tax (Palestine Economic Policy Research Institute, 2025). The average dollar-shekel exchange rate was set at 3.5, as prices fluctuate around this average, based on the average observed over the past 10 months of the analysis. Local experts were also consulted regarding the expected export percentage for self-consumption without storage, which was estimated at 50% of production, while for storage case, the percentage was estimated at 20%. Interviews with local experts indicate that several indirect advantages could be achieved from the PV installed systems, which are not accounted for in this analysis, including:

1. Renewable energy systems are expected to contribute in reduction of net lending due to the reduction in electricity imports from the Israeli Electricity Company in favor of local production.
2. Given the lack of direct government incentive for renewable energy systems in the residential sector, the widespread installation of PV systems could provide additional income for the Palestinian government, especially if contractors are able to comply with official billing requirements.
3. Solar systems in the residential sector offer an additional advantage over energy distributors, because it is connected to low voltage grid, and therefore technical losses may be lower than those incurred on imported electricity.
4. Renewable energy also could create additional job opportunities. These opportunities are estimated at 3 permanent jobs and 20 temporary jobs for every megawatt invested.

A 5-year period was used in the analysis for the solar system production period. As the net billing system is subject to change in the future, and the remain period of the national renewable energy plan 2025-2030 is around 5 years. Therefore, analyzing a long period of time was avoided. Table 1 illustrates the main assumptions utilized in this study and sources of collected data:

A special Microsoft excel sheet was developed to analyze the available data and related calculations.

4.1. Net Billing Scenarios

4.1.1. Buy-all sell-all case

This case relies on selling the entire production to the distributor, while purchasing the needed electricity for the household from the distributor, separately, therefore self-consumption is not allowed in this scenario. Figure 4 represents the flow of electricity in this scenario.

Table 1: Main consider assumptions in the study

No.	Assumptions	Source of data
1	Yearly production of each KW, PV System, at 1st year=1700 KWh	Eng. Waleed Othman, Technical Engineer, PENRA
2	Yearly reduction in production of PV system=0.7%	
3	Base Scenario: Percentage of each case of Net Billing, 10% Buy all sell all, 10% self-consumption and 80% self-consumption with storage capacity. Another scenario to be tested considering equal percentages	Eng. Basel Yaseen, Deputy Chairman of the palestinian energy and natural resources authority for technical affairs
4	Total expected target of PV in the residential sector in 2025-2030 is 15,000 Systems	
5	3 permanent jobs and 20 temporary jobs for every renewable energy megawatt invested.	
6	Percentage of self-consumption in residential sector around 50%, in case of absence of storage capacity. While in case of storage availability 80% and even more	Eng. basel abduljawad, deputy technical manager, PETL
7	The PV systems in residential sector are connected to low voltage grid, and could reduce the technical losses compared to imported electricity	
8	The current purchase price at medium-voltage electricity from major suppliers around 0.411 New Israeli Shakel, NIS per KWh, is the approved feed in tariff in the net billing regulation for selling renewable energy products to distributors.	
9	Cost of each installed kW of PV system is around 1000 USD, and 1500 USD in case of storage availability	Mansour Mansour, Pal Solar Company
10	Main expected scenario of RE investments 1 KWh storage capacity per each KW. The size of 5KW PV system is expected to be more common	Eng. Basel Yaseen, Deputy Chairman of the palestinian energy and natural resources authority for technical affairs
11	Incentives 10-20% for PV investments in household sector could be effective	
12	Period of analysis is 5 years, since the regulations are changing from time to time	Author of this study
13	VAT in Palestine 16%	Published and adapted
14	The average purchasing price per kilowatt-hour in the residential sector from distributor is around 0.16 USD	Palestine economic policy research institute, 2025
15	USD/NIS is 3.5	Average of the last ten previous months of existing analysis

Figure 4: Sell all buy all scenario

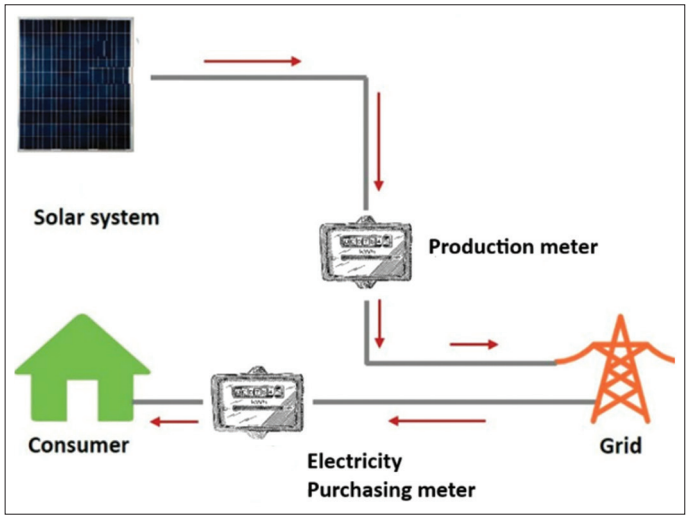
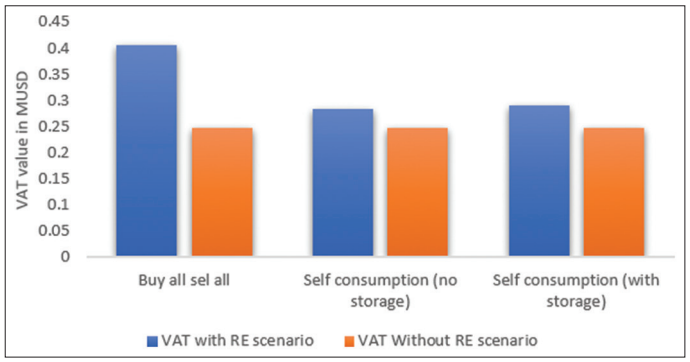


Figure 5: Total value-added tax values in the three scenarios, for each megawatts of renewable energy, including and excluding renewable energy



The obtained difference in value-added tax between the case of installing renewable energy systems and absence of the RE system amounts to 160,000 USD for the benefit of government. Figure 5 illustrates the result for each megawatt of renewable energy invested in the household sector, considering 5-year period in the analysis. This difference stems from the value-added tax (VAT) on renewable energy equipment, since VAT in the Palestinian territories is 16% on all goods and services. The VAT value on renewable energy equipment is 16%, and the value of VAT value on the sold electricity to the final consumer is 16% as well.

However, the difference in VAT to the favor of the government stems from the VAT on PV system equipment compared to the absence of RE situation. Such VAT applied on importing material from abroad, this tax does not exist in case of the absence of the solar system. In this case, there is no VAT reduction on electricity due to the lack of self-consumption. Therefore, the electricity exported from the system to the grid is considered a substitute for the same amount of energy that would have been imported, no solar energy system scenario, regarding VAT values. As a result, the VAT value on the equipment is a surplus value for the government in this case.

The estimated target of 7.5 megawatts is based on assuming 10% of total expected national target for residential sector in 2030. The total obtained difference in value-added tax in favor of the government during the 5-year period was 1,200,000 USD/the 7.5 MW, for this scenario. This case is simple case, since no self-consumption is allowed, and the exported electrical energy to the grid is a local alternative to the imported electricity from abroad, so the VAT on energy which represents the current situation has no reduction, while VAT on equipment is surplus. The base scenario of analysis considered 10% of national target in the residential sector in 2030, could be achieved through this scenario of net billing.

There is also a possibility that the VAT value of electricity could increase if there is a shortage of energy in the area where the renewable energy system is installed. Since, in this case, the exported energy from the solar energy system will not affect the VAT on imported energy form abroad, but it could participate in providing energy to reduce the shortage in power supply. Therefore, this possibility will have another positive effect on the VAT values of electricity to the government, which is collected from the end user. Such possibility has not been included in the analysis because of the shortage in available related data.

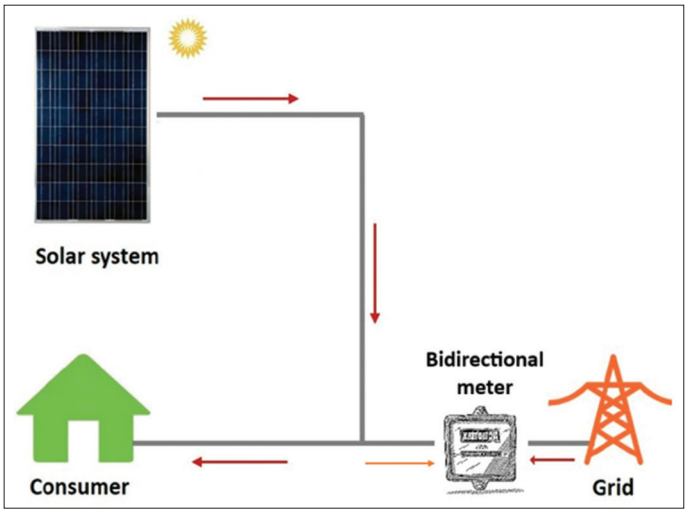
4.1.2. Self-consumption and export surplus case, without storage capacity

This scenario allows the owner of a renewable energy system to consume the desired percentage of the system's production and export the surplus without a storage system, this scenario set monthly fees per each installed kW on the rooftop. According to local experts, the export percentage in this scenario is estimated at an average of 50% of production. Figure 6 represents the flow of electricity for this scenario.

The difference in value-added tax between the case of a renewable energy system and its absence, shows that the difference over the analyzed 5-year period was 36,636 USD per each invested megawatt in the household sector, as shown in Figure 5.

The obtained difference in value-added tax in favor of the government in this case considering 10% of the national target, 7.5 MW, over the 5-year period was 274,767 USD. The analysis was based on the assumption that 50% of the solar system's output would be consumed internally. This could result in lost revenue related to VAT on consumed energy, due to self-consumption of energy, while the government would receive VAT revenue on the solar power system equipment. Therefore, the difference of VAT for the favor of the government is less than the previous scenario. The base scenario of analysis considered 10% of national target in the residential sector in 2030, could be achieved through this scenario of net billing.

Figure 6: Self consumption allows export scenario



4.1.3. Self-consumption with storage

This scenario is the least percentage of RE production export to the grid, due to the availability of storage capacity, estimated at 20% of production. Based on consultations with experts in this field, the scenario in which the solar energy system of 5 kW and a storage capacity of 5 kWh was adopted, common expected scenario, interviewed experts believed that such case could be the highest percentage in future applications under the new net billing system. Figure 7 presents the flow of electricity for this scenario.

The difference in value-added tax (VAT) for the favor of the government, between the presence of a renewable energy system and the case of absence RE systems, was obtained at 42,894 USD. The analysis was conducted per megawatt of RE that could be invested in the Palestinian household sector, with storage capacity, as shown in Figure 5. The expected investments of RE until 2030, estimated at 60 megawatts, 80% of national expected target for residential sector, the total obtained difference in value-added tax in favor of the government was 2,573,651 USD for this scenario. The base scenario of analysis considered 80% of national target in the residential sector in 2030, could be achieved through this scenario of net billing.

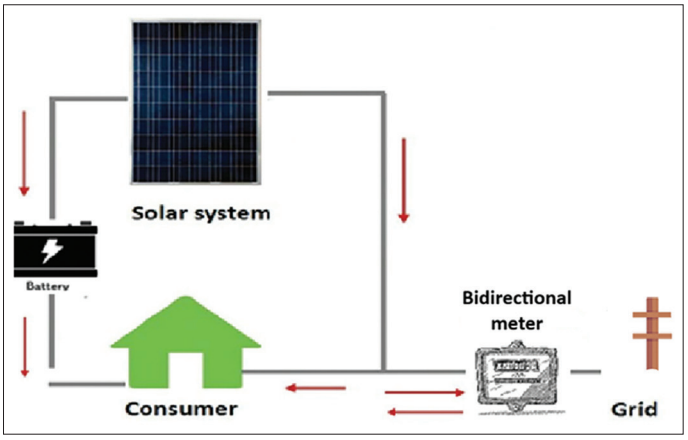
Figure 5 above shows the impact of the three net billing scenarios on the VAT values per megawatt of renewable energy. Clearly, the difference is highest in the first scenario, favoring the government. Since the first scenario does not allow for self-consumption; therefore, the VAT on electricity will not be negatively affected in this scenario. Instead, the VAT on the solar system equipment will be added to the total VAT revenue for the government.

4.2. Impact of RE on VAT in the Residential Sector at the National Level

The total VAT difference in favor of the government over 5 years in the three cases, scenarios, was identified at 4,048,418 USD, assuming 100% national RE target in the residential sector until 2030 could be achieved. Other scenarios, considering partial achievement of national target was analyzed and presented also.

This study assumed the baseline scenario in conducted analysis, whereby 80% of the RE systems expected to include storage

Figure 7: Flow of electricity for self-consumption, storage capacity and export scenario



systems along with the solar system. The remaining percentage would be achieved equally between the first and second net billing scenarios. Another scenario was also examined, that assumes equal percentage of each net billing case in the total target, instead of 10%, 10% and 80%. It was found that 48% increase in the VAT differences in favor of the government for equal percentage could be achieved, compared to the previous basic scenario, 10%, 10% and 80%. Therefore, the total VAT difference considering this assumption, could reach around 6 million USD, considering the whole target of national plan in residential sector. Figure 8 illustrates the values in VAT differences in both cases, equal and different percentage of net billing scenarios.

4.3. Installed PV Capacity and Split Percentage Effect on VAT Benefit

Due to the uncertainty situation in the Palestinian territories because of unstable economic conditions and the possibility of failing to achieve the national targets, an analytical scenario has been conducted for different levels of targets of PV systems in residential sector. Starting from 15 MW, representing 20% of the expected national target until 2030, and ending with exceeding the national target of 75 MW by 20%, hence installing 90 MW. This scenario demonstrates the impact of renewable energy in the household sector as the differences in value-added tax (VAT) for the favor of Palestinian government. Figure 9 shows the expected differences of VAT in favor of the government, as 20%, 100% and 120% of the national targets are met. Both cases, similar percentage scenarios and different percentage scenarios, results presented in Figure 9.

The increased percentage in VAT in the revised analysis compared to base scenario was due to the higher percentage of the first case of the net billing system, which requires the owner of the renewable energy system to sell the entire production to the distributor and purchase all of its needs from the grid. This confirms the findings of this study, which states that this case, sell all buy all, of net billing is the best in terms of value-added tax differences in favor of the government.

4.4. Utilizing VAT Difference to Incentivize Renewable Energy Investments

Utilizing the difference in VAT to fund and incentivize renewable energy investments in the residential sector could enhance the implementation of renewable energy in Palestine. Figure 10 illustrates the size of investments that could benefit from this fund in megawatts, according to each suggested percentage of incentive to capital cost. The figure also shows both cases, with and without storage. The figure represents the probability of the net billing scenario percentages being different, the base scenario: 10% for each of the first and second scenarios of net billing system, and 80% for the third scenario, which includes storage. It is expected that the capacity of investments benefiting from the VAT difference fund subsidy could reach 40 MW if the subsidy is 10% and applies to systems without storage. However, it may reach 27 MW if the subsidy applies to systems with storage, assuming the subsidy covers only one system, with or without storage capacity. If both systems are covered, the investment capacity will depend on the percentage benefiting from the subsidy. The value of investments benefiting from the incentives decreases as the subsidy percentage increases but it could be more attractive for the investors.

Figure 11 shows the impact of the incentive percentages on investments with and without storage, when the probability of the three scenarios is equal. It is expected that the value of investments benefiting from the subsidy could reach 60 MW if the subsidy is 10% and applies to systems without storage capacity, buy all sell all scenario. However, it may reach 40 MW if the subsidy applies to systems with storage, assuming the subsidy covers only one

Figure 8: Value of value-added tax differences in case of equal and different percentages of net billing scenarios

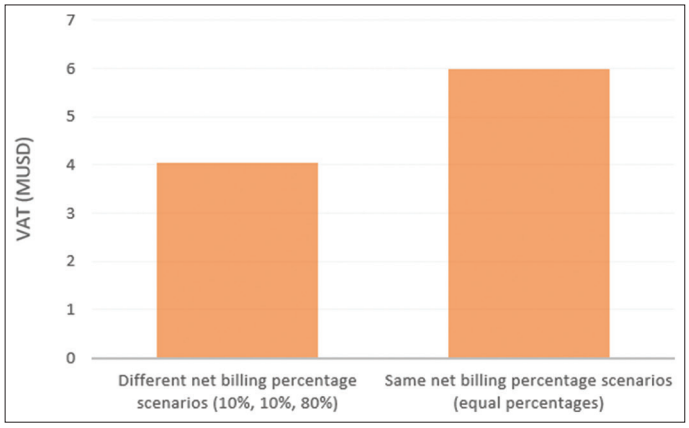


Figure 9: Total value-added tax in favor of the government, considering several powers of national target achievement.

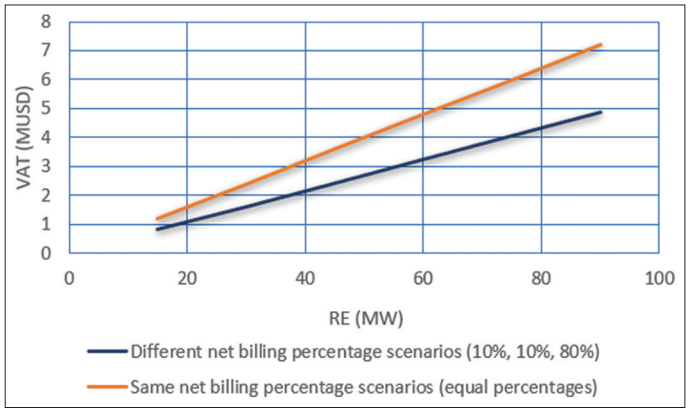


Figure 10: Expected investment benefiting from proposed subsidies utilizing difference in value-added tax, in case of different percentages of net billing scenarios (base scenario).

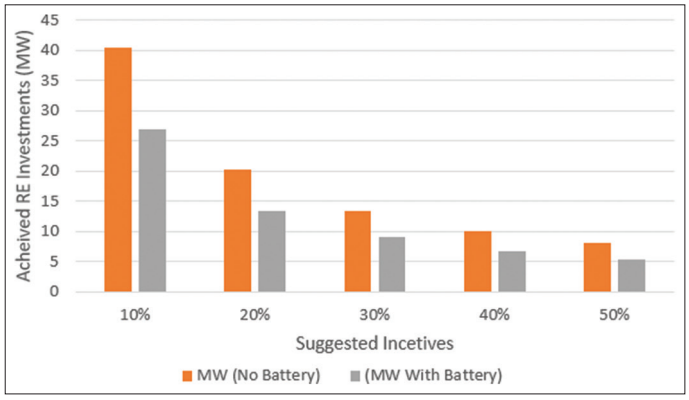
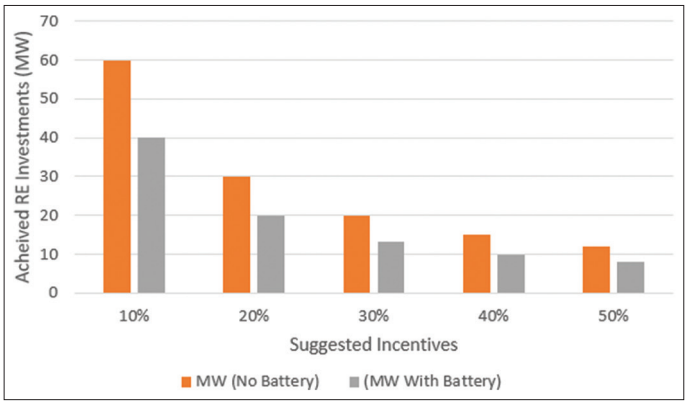


Figure 11: Expected investment benefiting from proposed subsidies utilizing difference in value-added tax (equal percentages of net billing scenarios)



system, with or without storage capacity. If both cases are covered, the investment capacity will depend on the percentage benefiting from the subsidy. The value of investments benefiting decreases as the subsidy percentage increases, but in case of increasing the incentives it could be more attractive for the investors.

4.5. Proposed Incentive Policy

The result of the above analysis showed that the first scenario, "Sell All, Buy All," is the most favorable for the government's VAT difference. The results also indicated that the surplus VAT revenue, if the targets in the National Renewable Energy Plan are achieved, could reach around 6 million USD in 5 years. Furthermore, the results showed that incentives could lead to additional investments in the residential sector up to 60 MW, if the incentive rate is 10% of the capital cost of PV system in the residential sector, and the net billing scenarios have equal ratios. In the baseline scenario, where the ratios differ between net billing cases, with 80% of solar energy systems including storage, the differences in VAT value were around 4 million USD.

Therefore, buy all sell all scenario, the most VAT surplus revenue for the government, was chosen as the basis for a renewable energy incentive policy in the residential sector. Given the limitations of the Palestinian Ministry of Finance's procedures regarding VAT rate reductions, it was proposed that the incentive policy to be implemented through one of the following two possibilities:

1. Through electricity distribution companies, whereby the distributor provides this incentive to the investor via the monthly bills and is reimbursed by the government through monthly VAT offsetting
2. Through the establishment of a national fund, financed by the VAT surplus.

The proposed incentive constitutes 62% of the VAT surplus, which is equivalent to the incentive that was proposed, 10% of the cost of the RE system. The proposed incentive is limited to the first scenario, "Sell All, Buy All," in residential sector. Therefore, a certain percentage of the VAT surplus remains with the government to cover expenses during the implementation of the incentive policy. Furthermore, the possibility of international institutions contributing to the fund remains open to help the government reduce its obligations, during this period of challenging economic conditions. The deployment of solar energy systems will also positively impact the business environment and the banking sector by a factor of 5 times compared to electricity imports, as demonstrated in the literature review of this study. This, will positively impact the government treasury due to increase in government revenue from income tax, and diversified economic activity resulting from stimulated investments.

5. CONCLUSION

The value-added tax (VAT) on solar energy systems in the residential sector represents an additional cost for the investor, and the current VAT system does not allow for the recovery of this high value tax, 16% of the system's cost. Therefore, this study focused on utilizing a portion of the surplus VAT revenue generated by the government from solar energy investments as an incentive to encourage further investments in this sector. The following are the key findings of the study:

First, significant difference in the value-added tax (VAT) in favor of the government was observed, between the presence and absence of solar energy systems. This difference varies from one system to another due to the different net billing implemented scenarios in the Palestinian territories. In the case of selling all production and purchasing all needed electricity from the grid, no self-consumption, the VAT surplus payable to the government was the highest.

Second, the total obtained VAT difference in favor of the government over 5 years, across all three net billing combined scenarios, assuming the achievement of the 2030 national residential sector target, was 4,048,418 USD. The considered ratios for net billing scenarios: 80% self-consumption with storage, 10% self-consumption without storage, and 10% selling all generated electricity and purchasing the required electricity separately from the grid. It was obtained also, that the VAT surplus value increased by 48% when the applied ratios of net billing scenarios are equal across the residential sector. Furthermore, the higher the percentage of sell all and buy all case among the three net billing cases, the greater the variance in favor of the government.

Third, in case of utilizing the difference in VAT to incentivize the RE in residential sector. The most optimistic scenario was expected the value of investments that could be benefiting from the subsidy was around 60 MW, at 10% subsidy. The optimistic scenario occurred in buy all sell al scenario, without self-consumption or storage capacity.

Forth, to support the transition to renewable energy and enhance its sustainability, an incentive policy was proposed, offering a 10% subsidy on the cost of renewable energy systems to encourage new investments in the residential sector. This subsidy is equivalent to using a portion of the VAT surplus, specifically 62% of the surplus. The first scenario of net billing system (buy all, sell all), was adopted in this study for implementing the incentive policy, in the residential sector. The study also proposed two implementation scenarios for suggested incentives to policymakers, that could be base for new policy.

Fifth, If the incentive rate exceeds 10%, the value of investments benefiting from the incentive decreases, but it could be more attractive to investors. In contrast, the surplus value from value-added tax is limited, which puts pressure on the state treasury.

Furthermore, additional researches are still needed in the area of developing and implementing a detailed incentive policy.

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